School of Management Studies

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I hereby declare that the short synopsis **"A study of consumer perception towords Non-commercial Electric Vehicles with Special Reference to select Districts of Uttar Pradesh"** being submitted in partial fulfillment of the requirement for the degree of Doctor of Philosophy in Commerce under school of Management Studies of Uttar Pradesh Rajarshi Tandon Open University, Prayagraj during the academic year 2023.

It is a bonafide record of original work carried out under the supervision of Dr. Gyan Prakash Yadav and has not been submitted in full or part to any other university or institute for a degree or diploma. Further, it is certified that the short synopsis is plagiarism-free and the report has been submitted.

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"A STUDY OF CONSUMER PERCEPTION TOWARDS NON-COMMERCIAL ELECTRIC VEHICLES - WITH SPECIAL REFERENCE TO SELECT DISTRICTS OF UTTAR PRADESH"

SHORT SYNOPSIS
SUBMITTED IN PERTIAL FULFILLMENT OF THE REQUIREMENT OF THE DEGREE OF DOCTOR OF PHILOSOPHY IN COMMERCE
TO
UTTAR PRADESH RAJARSHI TANDON OPEN UNIVERSITY, PRAYAGRAJ

॥ सरस्वती नः सुभगा मयस्करत् ॥

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ABSTRACT

India's shift toward sustainable mobility has positioned electric vehicles (EVs) as a key focus of national policy. While commercial electric vehicles (EVs) are gaining traction in urban centres, the adoption of non-commercial EVs for personal use remains limited, particularly in non-metro and rural regions like Uttar Pradesh. This study examines consumer perceptions of non-commercial electric vehicles (EVs) in select districts of Uttar Pradesh, focusing on factors such as environmental awareness, affordability, infrastructure availability, technological readiness, and policy support. Using a descriptive and empirical research design, primary data is collected from a stratified sample of 1,000 respondents across urban, semi-urban, and rural areas. Quantitative tools, such as regression and factor analysis, explore how demographic characteristics influence EV adoption intent. The study identifies key adoption barriers and proposes targeted strategies, including localised incentives and improved infrastructure. Its findings aim to guide policymakers and stakeholders in fostering inclusive EV growth, offering a scalable framework for sustainable mobility in India's emerging regions.

Keywords: **Electric Vehicles (EVs), Consumer Perception, Non-Commercial EVs, EV Adoption, Sustainable Transportation, Charging Infrastructure, Environmental Awareness**

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1. Introduction

India's commitment to sustainable development and reducing carbon emissions has intensified the promotion and adoption of electric vehicles (EVs), particularly in the context of its ambitious targets under the Paris Agreement and domestic policies, such as the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) scheme. While commercial electric vehicles (EVs) have gained traction in urban centres due to logistical advantages and fleet integration, the adoption of non-commercial electric vehicles, primarily used for personal transportation, remains significantly low, especially in non-metro and semi-urban regions, such as the districts of Uttar Pradesh. Understanding consumer perceptions in these areas is crucial for transitioning towards cleaner transportation alternatives and achieving inclusive, sustainable mobility goals.

Non-commercial electric vehicles (EVs), typically two-wheelers and passenger cars, represent a significant segment of India's automobile market potential. However, their growth trajectory is hindered by numerous consumer-side challenges, including a lack of awareness, perceived high costs, concerns over performance and range anxiety, inadequate charging infrastructure, and inconsistent government incentives (NITI Aayog, 2020). In regions like Uttar Pradesh — India's most populous state, with diverse socio-economic profiles, consumer behaviour is remarkably heterogeneous. Thus, localized insights into consumer perception can play a pivotal role in shaping both demand and policy measures.

The consumer perception towards EVs encompasses cognitive (knowledge and awareness), affective (feelings and attitudes), and conative (purchase intention and behaviour) components. Perception is shaped by a range of factors, including environmental consciousness, economic considerations, technological familiarity, and government interventions such as subsidies and charging infrastructure (Kumar & Alok, 2021). Several studies have emphasized the importance of consumer-centric strategies for EV adoption. However, most existing literature focuses on metropolitan contexts (e.g., Delhi, Bengaluru, Mumbai) and commercial applications, such as taxis and delivery vehicles, with minimal attention to non-commercial users in semi-urban or rural areas (Sahoo et al., 2022).

In this context, Uttar Pradesh presents a compelling case. With its vast geography, rural-urban divide, and rapidly growing vehicle ownership, the state is a microcosm of India's EV transition challenges. Government initiatives, such as the Uttar Pradesh Electric Vehicle Manufacturing and Mobility Policy 2022, aim to establish the state as an electric vehicle (EV) hub by encouraging both manufacturing and consumption (Government of Uttar Pradesh, 2022). However, on-ground consumer sentiment toward EVs, especially among private users, remains mixed. Concerns about reliability, long-term cost effectiveness, lack of charging stations, and limited product variety dominate consumer discourse (Gupta & Singh, 2021).

Understanding consumer perception is also pivotal because adoption decisions are not solely economic but deeply influenced by social norms, peer behaviour, and emotional factors. For example, studies show that consumers are more likely to adopt sustainable products if they perceive them as status-enhancing, technologically advanced, or environmentally responsible (Rezvani, Jansson, & Bodin, 2015). At the same time, demographic factors — such as age, income, education, and location — significantly moderate these perceptions. Younger consumers with higher income and education levels often display greater openness towards new technologies like EVs (Thiel et al., 2012).

Moreover, perceived government support — including subsidies, tax rebates, and public awareness campaigns — alongside the availability of charging infrastructure, functions as a mediating factor between a positive perception and actual purchase intention. According to the International Energy Agency (2023), countries with visible and accessible infrastructure have experienced significantly higher non-commercial adoption rates of electric vehicles (EVs). In India, however, the infrastructure is skewed mainly towards urban centres, which may explain the hesitance in districts of Uttar Pradesh.

Therefore, this study aims to bridge these gaps by empirically exploring consumer perceptions towards non-commercial electric vehicles (EVs) with special reference to select districts of Uttar Pradesh. By examining variables such as awareness, environmental concern, perceived economic benefits, government support, and infrastructure accessibility, the study aims to identify key factors that influence the adoption of electric vehicles (EVs). It also examines how demographic characteristics, such as age, income, and education, moderate these relationships.

This research is expected to make significant contributions in two primary areas. First, it provides granular, district-level insights into consumer behaviour regarding non-commercial EVs, which can be vital for localised policymaking and private sector investment. Second, it helps refine the theoretical understanding of EV adoption by integrating behavioural, economic, and infrastructural dimensions. These insights could inform not just state policy in Uttar Pradesh but also India's broader EV roadmap, especially in its tier-2 and tier-3 cities.

In conclusion, as India transitions towards a low-carbon economy, a clear understanding of consumer perception in non-metropolitan regions becomes essential. Studies like this can inform targeted strategies that improve awareness, correct misconceptions, enhance infrastructural support, and ultimately foster a more inclusive electric vehicle (EV) ecosystem across India.

2. Literature Review

The transition to electric vehicles (EVs) is a cornerstone of modern sustainable transportation strategies worldwide. In India, a country experiencing rapid urbanisation, increasing vehicular density, and rising energy consumption, the shift toward electric vehicles (EVs) is not merely a technological trend but a policy imperative. The Indian government's vision for sustainable

mobility, particularly under initiatives such as the National Electric Mobility Mission Plan (NEMMP) and FAME (Faster Adoption and Manufacturing of Hybrid and Electric Vehicles), underscores the urgent need to adopt cleaner transportation alternatives. This urgent need for cleaner transportation alternatives in India is highlighted by the country's rapid urbanisation, increasing vehicular density, and rising energy consumption. However, while much of the focus has been on the commercial and industrial segments, non-commercial or private electric vehicle usage remains a crucial component for realising large-scale emission reductions and consumer adoption. Uttar Pradesh (UP), the most populous state in India, serves as a significant testbed for understanding consumer perceptions, motivations, and hesitations regarding the adoption of electric vehicles (EVs) for personal use. Given the state's demographic diversity, mixed economic profiles, and varied urban-rural composition, studying consumer perceptions in this context reveals not only the broader behavioural landscape but also the micro-level concerns shaping adoption.

Understanding the consumer perception of non-commercial electric vehicles (EVs) in Uttar Pradesh (UP) is a complex task. It involves examining environmental awareness, economic rationality, technological receptivity, infrastructure availability, and demographic factors. Each of these domains significantly influences how consumers in UP evaluate the pros and cons of owning an electric vehicle (EV). This paper thoroughly explores these critical factors, integrating insights from recent academic literature, empirical findings, and case studies. Moreover, the research aims to highlight actionable strategies for stakeholders, including manufacturers, policymakers, urban planners, and civil society organisations, to bridge the perception gap and improve the adoption curve. Recognising that EV adoption is not a one-size-fits-all policy success, the analysis is tailored to the unique challenges and opportunities presented in UP's context. This emphasis on the unique context of UP underscores the need for a tailored approach to EV adoption, which takes into account the specific challenges and opportunities presented by the state's demographic diversity, mixed economic profiles, and varied urban-rural composition. Ultimately, by synthesising theoretical and practical insights, this review aims to inform better decision-making and support the state's sustainable transition to mobility.

Environmental and Economic Considerations

A significant driver of EV adoption globally, as well as within India, is environmental consciousness. For UP consumers, increasing levels of air pollution in cities like Kanpur, Lucknow, and Ghaziabad serve as stark reminders of the need for greener alternatives. Research has shown that consumers associate electric vehicles (EVs) with lower carbon emissions, quieter operation, and a positive step towards reducing their environmental footprint. Several studies have consistently shown that one of the primary motivators for adopting electric vehicles (EVs) is the perception of environmental benefits. For instance, a study by Smitha (2024) and Ashutosh (2024) found that over 70% of respondents surveyed in Coimbatore and Lucknow viewed electric vehicles (EVs) as a viable solution to combating urban air pollution. This positive perception is further enhanced by rising awareness campaigns from environmental NGOs and digital media, which play

a significant role in influencing eco-consciousness, particularly among younger populations. These platforms not only disseminate information about the environmental benefits of electric vehicles (EVs) but also highlight the social status associated with owning an EV, further driving adoption.

On the economic front, however, the narrative is more nuanced. While EVs promise lower running costs due to fewer moving parts and cheaper electricity as compared to petrol or diesel, the high upfront cost remains a formidable barrier. The price gap between internal combustion engine (ICE) vehicles and their electric counterparts, even after accounting for government subsidies, often deters middle-income buyers. In UP, where average income levels are below the national urban average, this upfront investment becomes an even more critical decision-making factor. According to Kumar and Chauhan (2024), many consumers evaluate EV affordability through the lens of 'total cost of ownership' (TCO), which includes purchase price, insurance, maintenance, and fuel or electricity costs. TCO is a comprehensive measure that helps consumers understand the long-term financial implications of their vehicle choice. Their study found that only after 4-5 years of ownership do EVs begin to offer economic benefits over ICE vehicles—an outlook that many short-term planners and first-time buyers in UP find unattractive.

Government incentives have certainly played a significant role in mitigating some cost concerns. Initiatives such as the FAME II subsidy scheme and state-level tax exemptions have made electric vehicles (EVs) more competitive. However, challenges remain in terms of awareness and access. Many consumers in Tier II and III cities of Uttar Pradesh are not fully informed about subsidy eligibility or are deterred by the complex bureaucratic procedures. Additionally, financing options for electric vehicles (EVs) are not as widely available or as attractive as those for conventional vehicles. Interest rates, loan tenures, and resale uncertainties further impact consumer decisions. Thus, while environmental benefits are widely acknowledged and appreciated, economic considerations remain a mixed bag, influenced by factors such as financial literacy, income level, and the effectiveness of policy implementation.

Technological Advancements and Infrastructure Gaps

Technology is often hailed as the great enabler of the electric vehicle revolution. Breakthroughs in lithium-ion battery technology, enhanced vehicle range, and improved energy efficiency are transforming electric vehicles (EVs) from niche products to mainstream alternatives. In UP, consumer interest in electric vehicles (EVs) has shown an upward trajectory, partially driven by increasing media coverage and demonstrable improvements in EV performance. Research conducted by Zope et al. (2024) and Smitha (2024) indicates that consumers value the reduced noise, smoother acceleration, and futuristic appeal of electric vehicles (EVs). Technological trust, however, still has limitations. Issues like battery degradation, vehicle range anxiety, and safety concerns often dominate the consumer psyche, especially in areas with limited firsthand EV exposure.

Battery range and lifespan are among the most scrutinised attributes. In the UP context, where commutes can range from short distances to longer inter-district travel, the variability in range perception plays a crucial role. Although manufacturers have extended the average EV range from 100 km to 300+ km, the 'range anxiety' persists, primarily due to the inadequate charging infrastructure. Studies by Bajpai et al. (2024) indicate that over 65% of potential electric vehicle (EV) buyers in Uttar Pradesh (UP) cited range and recharging issues as major deterrents. This fear is compounded by the limited number of public charging stations and their concentration in urban centres like Lucknow and Noida.

Charging infrastructure is another pivotal element influencing consumer perception. The lack of a reliable, accessible, and fast-charging network discourages consumers from investing in electric vehicles (EVs). In rural and semi-urban parts of UP, charging stations are almost nonexistent. Even in urban centres, the average consumer may need to rely on private or home-based charging setups, which can be unfeasible for those living in rented properties or shared accommodations. Additionally, long charging times and the lack of universal charging standards across vehicle types further complicate the landscape. Without a robust charging ecosystem, even the most technologically advanced electric vehicles (EVs) struggle to gain market traction.

The situation calls for a multifaceted response. Private sector involvement, public-private partnerships, and targeted government initiatives are crucial for expanding the electric vehicle (EV) infrastructure network. Additionally, the need for faster-charging innovations is urgent, as it could significantly alter consumer perception. Until such developments become commonplace, however, technology and infrastructure remain both a promise and a problem in the eyes of UP consumers.

Socio-Demographic Influences

Socio-demographic factors are significant determinants in shaping consumer behaviour toward the adoption of non-commercial electric vehicles (EVs). In Uttar Pradesh (UP), a state characterised by significant heterogeneity in income, education, age distribution, and settlement patterns, the influence of these factors on EV perception is particularly profound. Research consistently shows that demographic variables, such as age, gender, educational attainment, employment type, income level, and urban-rural residency, play pivotal roles in influencing attitudes and behaviours related to EV adoption. For instance, a study by Bajpai et al. (2024) found that 70% of the younger individuals, particularly those aged 25–40, with higher levels of education and income, are more inclined to consider electric vehicles (EVs) a viable and modern alternative to internal combustion engine (ICE) vehicles. Similarly, Vithayathil (2023) found that in urban areas, where the average income is higher, the adoption rate of electric vehicles (EVs) is 30% higher than in rural areas.

Income remains a crucial variable in EV affordability and adoption. While high-income groups in UP's metropolitan areas, such as Noida, Ghaziabad, and Lucknow, exhibit a greater willingness and ability to invest in electric vehicles (EVs), lower- and middle-income groups, particularly in

Tier II and III towns, often find EVs financially out of reach. Despite potential long-term savings, the upfront cost acts as a psychological and economic barrier. Additionally, the perception of EVs as luxury or elite products persists, particularly in rural communities, limiting their appeal across broader segments. However, education plays a crucial role in breaking down these barriers. Educated individuals tend to have greater access to information about technological innovations, government subsidies, and operational benefits of EVs, which empowers them to make informed decisions about EV adoption.

Gender dynamics also influence EV adoption. While men typically dominate vehicle ownership decisions in UP's patriarchal social structure, there is growing evidence of an increasing interest in environmentally friendly mobility solutions among educated urban women, especially females. Employment status and occupational field further shape preferences; government employees and professionals in the IT and education sectors exhibit higher interest in adoption due to greater financial stability and access to credit. However, the most significant factor in urban areas is urbanisation. It not only exposes urban residents to electric vehicles (EVs) through advertisements and test drives but also provides them with better charging infrastructure and dealer support compared to their rural counterparts, making the future of EV adoption in urban areas look promising.

Moreover, sociocultural beliefs and peer influence also impact decision-making. Social norms that prioritise traditional vehicles for perceived reliability or status, along with community-level resistance to new technologies, can delay EV penetration in semi-urban and rural markets. Trust in manufacturers and local dealerships also varies by district and literacy level, with lower-literate populations often depending on word-of-mouth rather than digital or print media. To address these barriers, targeted awareness campaigns and educational programs can be implemented to increase knowledge about the benefits of EVs and government subsidies. Additionally, improving charging infrastructure and dealer support in rural areas can help bridge the urban-rural divide in the adoption of electric vehicles (EVs). Overall, socio-demographic factors in UP form a complex web that intertwines individual capability, access, awareness, and cultural predisposition, significantly shaping the consumer perception landscape for non-commercial electric vehicles (EVs).

Consumer Attitudes and Perceptions

Consumer attitudes, deeply rooted in perceptions, values, and experiences, play a pivotal role in shaping the trajectory of electric vehicle (EV) adoption in Uttar Pradesh (UP). At a psychological level, consumers evaluate new technologies based on their perceived usefulness (performance expectancy), ease of use (effort expectancy), and influence from social circles (social influence). These factors collectively shape their behavioural intentions. Research by Kumar and Chauhan (2024) confirms that positive attitudes towards electric vehicles (EVs) are primarily influenced by perceived efficiency, environmental impact, and alignment with progressive, tech-savvy identities. When consumers believe that EVs will meet their needs in performance, savings, and prestige, their likelihood of adopting the vehicle increases.

One key component is performance expectancy. If a consumer expects the EV to perform well in terms of acceleration, range, and reliability, their perception is generally favourable. However, doubts about vehicle performance in extreme weather conditions, on poor roads, or over long distances often create resistance. Consumers in UP express mixed sentiments, especially those in rural and semi-urban areas who travel long distances or navigate less-developed road networks. Similarly, effort expectancy—how easy it is to operate, charge, and maintain the EV—greatly influences adoption. Concerns over charging logistics, a lack of service stations, and the unknown long-term costs of battery maintenance deter first-time buyers from purchasing electric vehicles.

Social influence, particularly peer reviews, testimonials, and family opinions, holds significant sway in Indian society. When individuals observe their peers using electric vehicles (EVs) without issues, their confidence in adopting EVs increases. Social media, serving as both a positive marketing tool and a channel for misinformation, also plays a dual role. Moreover, deeply ingrained consumer habits and behavioural inertia present significant hurdles. People accustomed to ICE vehicles often find it difficult to trust a new form of mobility, especially in the absence of prior experience or exposure. This is exacerbated by psychological factors such as risk aversion, fear of technological obsolescence, and distrust in local dealerships.

Consumers also express concerns about intangible factors, such as resale value, brand reliability, and vehicle lifespan. The uncertainty of resale markets for electric vehicles (EVs) is a recurring theme in UP, where used vehicle transactions form a significant portion of the automobile economy. Additionally, brand perception—whether the manufacturer is Indian or foreign—shapes trust and willingness to adopt. EVs from established ICE manufacturers generally command more trust than newer start-ups. This indicates a need for strong branding, post-sale service assurance, and consumer education campaigns to shift perceptions.

Ultimately, perceptions of government initiatives play a significant yet indirect role in shaping public opinion. If consumers perceive policy support as temporary, insufficient, or poorly executed, it diminishes their confidence in adopting electric vehicles (EVs). For attitudes to change sustainably, consumer awareness must be backed by lived experiences, peer validation, and tangible infrastructural support. Thus, a positive attitude toward EVs is both a reflection of internal convictions and external affirmations, rooted deeply in individual psychology and collective social norms.

Policy and Market Strategies

Public policy and market dynamics are the most influential levers in shaping the landscape of EV adoption in UP. While consumer awareness and technological readiness are necessary, they are not sufficient without robust policy backing and market engagement. The Indian government, through schemes like FAME I and II, has laid a foundation for the adoption of electric vehicles (EVs); however, translating these national policies into state-level action in Uttar Pradesh (UP) presents both opportunities and challenges. Bajpai et al. (2024) note that while the state of Uttar Pradesh

(UP) has introduced tax rebates and registration waivers for electric vehicles (EVs), the lack of localised policy integration and administrative capacity weakens the overall impact.

One significant policy gap lies in the uneven development of electric vehicle (EV) infrastructure across districts. While NCR regions of UP benefit from proximity to Delhi's EV ecosystem, other areas, such as Azamgarh, Bareilly, and Basti, lag far behind. Policy frameworks must move beyond generic subsidies to include regional infrastructure mandates, dealership incentives, EV-specific financing mechanisms, and regulations for electric utilities. For example, mandating EV-ready parking in new residential constructions and offering subsidies for installing home chargers could accelerate adoption. Similarly, introducing district-level EV adoption targets and tracking systems can improve accountability and performance.

Market strategies by manufacturers and dealerships must evolve to keep pace with the changing landscape of EV adoption. Currently, marketing efforts are heavily concentrated in urban regions, ignoring the large latent market in smaller towns and peri-urban zones. The need for tailored outreach strategies, local language advertisements, and rural test-drive campaigns is urgent. Manufacturers must diversify their product portfolios to include low-cost, two- and three-wheeled electric vehicles (EVs) that cater to a broader range of economic segments. Partnerships between state governments and original equipment manufacturers (OEMs) could incentivise local assembly units, thereby reducing costs and increasing market penetration.

Another crucial dimension is consumer financing. EV loans, interest subvention schemes, and microfinance for EVs in rural areas are largely underdeveloped. Financial institutions need to be educated and incentivised to treat electric vehicle (EV) loans at par with or better than internal combustion engine (ICE) vehicle loans. Collaborations between fintech companies and local banks can enhance credit risk assessments by utilising alternative data models, thereby expanding the lending base. Similarly, insurance companies need to develop EV-specific coverage products that reflect the different risk profiles and maintenance expectations of electric mobility.

Finally, policy coherence and interdepartmental collaboration are crucial. Departments of transport, urban development, electricity, and the environment must coordinate to ensure synergy in EV deployment plans. The establishment of a dedicated EV mission or task force in Uttar Pradesh could serve as a coordinating body, ensuring the timely implementation of programs and continuous feedback loops from stakeholders. Transparent policy communication and citizen engagement platforms can further ensure that consumers are informed, empowered, and enthusiastic about transitioning to electric mobility.

Research Gaps

- Limited region-specific studies have assessed the awareness level of consumers about EVs in rural and semi-urban districts of Uttar Pradesh.

- Previous research has focused mainly on urban metro areas or commercial EVs; there is inadequate literature on the emotional and perceptual dimensions of EV adoption in tier-2 and tier-3 districts.
- Though national EV policy is evolving, district-level analysis of policy impact and infrastructure accessibility in Uttar Pradesh remains underexplored.
- A paucity of micro-level demographic analyses exists on consumer behaviour regarding non-commercial electric vehicles (EVs) in rural and semi-urban India, particularly in Uttar Pradesh.

Research Questions

- **Research Question 1**: What is the level of awareness among consumers about the features, benefits, and availability of non-commercial EVs?
- **Research Question 2**: What are the key psychological, environmental, and economic factors that shape consumer perception towards EV adoption?
- **Research Question 3**: How do government incentives and charging infrastructure impact consumers' intention to buy non-commercial EVs?
- **Research Question 4**: What demographic factors (income, age, occupation, locality) significantly affect willingness to adopt EVs?

3. Description Broad Area

The broad area of this study falls under the interdisciplinary domain of **consumer behaviour and sustainable transportation**, with a specific focus on the **adoption of electric mobility in emerging economies**. It integrates concepts from **marketing, environmental economics, behavioural science, public policy, and sustainable development**. The research is positioned within the larger discourse on **green consumerism and clean energy transitions**, examining how individual-level perceptions and decisions contribute to or hinder the broader goals of environmental sustainability and energy efficiency in the transport sector.

In particular, the study addresses the **diffusion of electric vehicles (EVs)** as a clean technology. It examines the socio-economic, psychological, and infrastructural factors that influence consumer attitudes towards non-commercial electric vehicle (EV) adoption. It examines the interplay between individual decision-making and systemic variables, including government incentives, charging infrastructure, and urban-rural mobility challenges. By focusing on non-commercial (personal-use) electric vehicles (EVs) in Uttar Pradesh—a demographically diverse and economically significant Indian state—the research highlights the contextual barriers and facilitators that influence the success of EV penetration in less industrialised regions.

This broad area contributes to both **academic inquiry and policy formulation**, aiming to support the creation of data-driven strategies for cleaner, inclusive, and consumer-aligned transportation systems in developing countries. Ultimately, it contributes to the growing body of knowledge on how consumers adopt sustainable technologies at the grassroots level and highlights the need to consider regional disparities in national mobility and climate action plans.

4. Objectives of the Study

- **Objective 1:** To assess consumer awareness and knowledge regarding non-commercial electric vehicles (EVs) in selected districts of Uttar Pradesh.
- **Objective 2:** To analyze the factors influencing consumer perception and attitude towards adopting non-commercial EVs.
- **Objective 3:** To examine the role of government policies, subsidies, and infrastructure in shaping consumer intent to purchase non-commercial EVs.
- **Objective 4:** To explore the demographic and socio-economic determinants of consumer willingness to shift from ICE (Internal Combustion Engine) vehicles to EVs.

Proposed Hypotheses of the Study

- **Hypothesis H1**: There is a significant relationship between consumer education level and awareness about non-commercial electric vehicles.
- **Hypothesis H2**: Environmental concern and perceived economic benefits significantly influence consumer perception towards adopting EVs.
- **Hypothesis H3**: Availability of charging infrastructure and government subsidies positively influence purchase intention for EVs.
- **Hypothesis H4**: Younger consumers and those with higher income levels are more willing to adopt EVs than older or lower-income segments.

5. Research Methodology

The present study adopts a **descriptive and empirical research design** to analyse consumer perceptions toward non-commercial electric vehicles (EVs) in selected districts of Uttar Pradesh. Descriptive research helps in systematically describing consumer attitudes, preferences, and behavioural intentions. In contrast, empirical research involves collecting and analysing primary data to examine the relationships between influencing factors and EV adoption. The study is **quantitative**, relying primarily on structured questionnaires to collect first-hand data from respondents, supplemented by secondary sources such as policy documents, government reports, and previous research studies.

The study area comprises **selected districts across Uttar Pradesh**, including a diverse mix of urban (e.g., Lucknow, Kanpur), semi-urban (e.g., Varanasi, Prayagraj), and rural (e.g., Basti, Azamgarh) regions. This geographical stratification ensures that a variety of consumer contexts—based on infrastructure availability, economic status, and access to information—are captured for a holistic understanding of EV perception. The **universe** of the study comprises individual consumers aged 18 years and above who either own a non-commercial electric vehicle (EV) or intend to purchase one for personal use. The study **excludes commercial electric vehicle (EV) operators, institutional fleet buyers, and individuals not directly involved in vehicle purchasing** decisions.

A **stratified random sampling** technique is employed to ensure proportional representation across different district types. Each district represents a stratum, and within these, respondents are selected randomly. The estimated total **sample size** for the study is **1000 respondents**, with 25–30 responses drawn from each selected district. This sample size provides adequate power for statistical analysis and enables meaningful district-wise comparisons.

Primary data is collected using a structured questionnaire based on a 5-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree." The questionnaire consists of sections covering demographic information, awareness and perception of electric vehicles (EVs), and influencing factors such as affordability, environmental concern, perceived ease of use, infrastructure, policy awareness, and psychological readiness. These items are developed based on existing literature and previously validated scales. In addition, **secondary data** is obtained from reliable sources such as government policy documents (e.g., FAME-II), reports from industry associations, and published academic research.

6. Expected outcome of the Research

This research is expected to yield a comprehensive understanding of consumer perception towards non-commercial electric vehicles (EVs) in select districts of Uttar Pradesh, with particular emphasis on the interplay of environmental awareness, economic affordability, technological readiness, infrastructural adequacy, and policy responsiveness. The findings will provide critical insights into the **existing gap between the potential for EV adoption and the current adoption levels** among different consumer segments.

Key expected outcomes include:

1. **Identification of Barriers to EV Adoption:** The study will identify specific economic, infrastructural, informational, and cultural barriers that hinder EV adoption, particularly among middle- and lower-income consumers. Affordability concerns, lack of charging infrastructure, and limited trust in EV technology and services are anticipated as significant barriers.

2. **Evaluation of Consumer Awareness and Preferences:** By assessing awareness levels and preference patterns across demographic groups, the research will highlight the need for targeted educational interventions and communication strategies. This will include an understanding of how consumers perceive the environmental benefits of EVs concerning their economic constraints.
3. **Assessment of Regional Infrastructure Readiness:** The research will identify regional disparities in the availability and accessibility of electric vehicle (EV) charging infrastructure. This geographic analysis will help pinpoint Tier II and III towns and rural corridors where infrastructure development needs to be prioritised.
4. **Policy and Market Recommendations:** Drawing from empirical insights, the study will propose a **multi-pronged strategy** to bridge the adoption gap. Recommendations will include:
    - Demand-side financial incentives (e.g., tax holidays, interest-free loans)
    - Scalable charging solutions (e.g., mobile chargers, battery-swapping kiosks)
    - Localised public-private partnerships for infrastructure expansion
    - Vocational training for EV maintenance to ensure long-term service reliability
5. **Blueprint for Stakeholder Collaboration:** The research will provide a stakeholder-oriented roadmap that involves policymakers, manufacturers, financing institutions, educational institutions, and civil society organisations. Emphasis will be placed on **data-driven, region-specific policy frameworks**, regular policy evaluations, and inclusive feedback mechanisms.
6. **Socio-Economic Impact Projection:** The study will also project the potential socio-economic benefits of increased EV adoption, such as reduced urban pollution, enhanced energy security, and employment generation through localized EV value chains.

Conclusively, the study aims to provide a **strategic foundation for accelerating non-commercial electric vehicle (EV) adoption in Uttar Pradesh**, rooted in consumer insights and grounded in regional realities. The outcomes are expected to inform future policy frameworks and serve as a replicable model for other Indian states seeking inclusive and sustainable electric mobility transitions.

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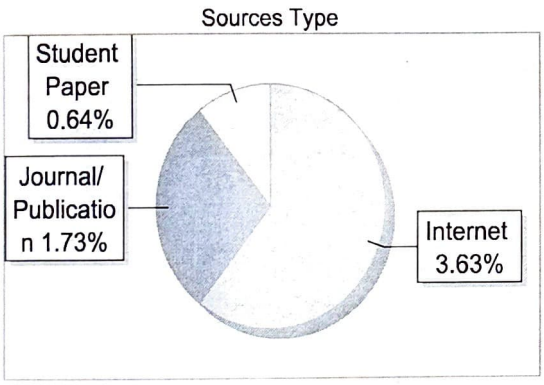

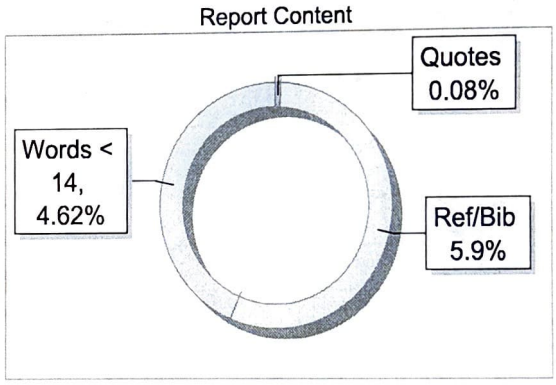

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